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ABSTRACT

Shelf browsing demands open access for the browser and a resources arrangement that groups related concepts together and thereby permits retrieving hitherto unknown items by association. Many resources, especially in large academic libraries, are technically open to the public but arranged in a way that prevents shelf browsing according to the definition given. A historical perspective shows how librarians have reacted to ever growing space pressures and includes discussions of electronic publishing and microforms as a space solution, selection criteria for storage, housing and arranging the relegated materials, and degrees of speed of public access. To support the statement that stored resources should be shelved compactly in sized rather than in classed, or shelf-browsable order, three points are developed: (1) an increasing proportion of academic library resources are already shelved in nonshelf-browsable order; (2) for more than a century academic library resources have been arranged according to a sliding scale of speed of public access; and (3) shelf browsing is an excellent retrieval device for a casual search but very unreliable for research purposes. Categories of materials that should remain in classed, shelf-browsable order are then listed. (Author/THC)

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# Shelf Browsing, Open Access and Storage Capacity in Research Libraries

by

John J. Boll

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## ABSTRACT

This article defines shelf browsing and points out that shelf browsing demands open access for the browser and a resources arrangement that groups related concepts together and thereby permits retrieving hitherto unknown items by association. Many resources, especially in large academic libraries, are technically open to the public but arranged in a way that prevents shelf browsing according to the above definition. The probable reason is the administrator's assumption that it is better to have an item in nonshelf-browsable form or arrangement than not at all. The writer advocates extending this reasoning to the less used part of the printed collection.

A historical perspective shows how librarians reacted over the centuries to the ever growing space pressure. It points to the continually increasing number of monographs published worldwide and the increasingly successful preservation efforts and states that, in spite of the development of optical disc and videodisc storage, space pressure will continue for another 30 years and even increase. It will decrease only when academic libraries turn from storage and delivery and in-house use centers to switching stations that store relatively little themselves but primarily search electronic supplies and/or central data banks.

Local and in-house storage, used routinely, is advocated as the most effective space solution for the next few decades. The more prominent storage centers are: Yale, Texas, Princeton, Cornell, New York Public Library, and California. Research is cited that shows that selection for storage can be made effectively on the basis of past use, and that, once policies are set, the actual work can be done by nonprofessionals under professional supervision.

To support the statement that stored resources should be shelved compactly in sized rather than classed, or shelf-browsable order, three points are developed: (1) an increasing proportion of academic library resources are already being shelved in nonshelf-browsable order; (2) for over a century academic library resources have been arranged according to a sliding scale of speed of public access; and (3) shelf browsing is an excellent retrieval device for a casual search but very unreliable for research purposes. The last point is followed by a detailed list of situations that illustrate the unreliability of shelf browsing for research purposes.

Categories of materials are then listed that should remain in classed, shelf-browsable order. A library of 1 million volumes should be able to

store about one-third of its collection, and libraries of 2 million and over should be able to store at least half their collection in sized shelving. The resulting space gain is calculated. Any real or presumed loss in shelf browsing capability is far outweighed by the increasing searching capability of the computer. Now is the time to limit shelf browsing capability to those areas of a research-oriented library that deal primarily with current and frequently used resources.

## SHELF BROWSING, OPEN ACCESS AND STORAGE CAPACITY IN RESEARCH LIBRARIES

Bibliographic access to library resources is achieved by either searching in a bibliographical record or among the resources. The records include the catalog, bibliographies, indexes, abstracting services, guides, and computerized databases. Many resources in American libraries are organized so as to permit scanning them directly. "Presumably the reason most libraries are arranged by subject classes is to promote or facilitate direct access to the books they contain, as well as to promote browsing."[1]

### Shelf Browsing

Shelf browsing is often used when a subject rather than a name or title approach is considered useful. Webster defines browsing as reading "passages here and there in a book or a collection of books."[2] The *Librarians' Glossary* defines it as: "To investigate, without design, the contents of a collection of books or documents."[3] Celoria describes primarily one aspect of browsing, *serendipity*,[4] which the *World Book Dictionary* defines as "the ability to make fortunate discoveries by accident, such as finding interesting items of information or unexpected proof of one's theories, while looking for something else; discovery of things not sought."[5] Herner provides the most complete range of definitions for browsing that includes a wide spectrum of searching activities among the items and especially within bibliographic tools. They can be classed into three categories ranging from serendipity via undirected scanning to the purposeful, directed browsing search. Herner describes undirected scanning or browsing as sifting through a body of publications in a vague, but not pressing or even defined, hope of finding something useful or interesting. Purposeful or directed browsing, on the other hand, is begun with a specific intent or goal and proceeds along a sequential path between items and bibliographic citations, as the facts begin to unravel in accordance with the initial goal. Herner points out that the most common situation for the average person

is probably something between directed and undirected browsing, a kind of selective scanning.[6] It can take place within and among reference tools, bibliographic compilations, databases, or the actual resources themselves. The present article deals with one part of this array—shelf browsing—which demands two prerequisites: Open access for the browser, and a resources arrangement that groups related concepts together and therefore permits inspection, and thus retrieval or rejection, of hitherto unknown items by association. This limitation bears stressing since it often causes confusion and, therefore, illogical deductions: Shelfbrowsing does not include the recall of a specific known item, such as a user's going directly to the shelf to obtain the May 1982 issue of *American Libraries* or Microfilm M739 because she/he recalls that it contains a specific idea. User retrieval of known items is a matter of open access only if one insists on retrieving the item oneself although it could just as easily be retrieved by a stack attendant. But the recall of a specific known item cannot be considered shelf browsing since it does not presuppose a physical arrangement that brings related concepts together, although it demands that it brings items into a known sequential relationship, such as shelving microfilm M739 between M738 and M740.

**Not So Open Access**

American librarianship takes just pride in the open access principle which lets the public enter and shelf browse at will with a minimum of restrictions. But open access and shelf browsability are not synonymous. In all libraries, and most of all in large libraries, a high proportion of resources is technically open to the public but practically not shelf browsable in the sense of discovering hitherto unknown items within a known subject because of conceptual relationships. Library resources arranged by means other than subject are not really shelf browsable except in the casual nonpurposeful sense used by *Webster* and the *Librarians' Glossary*.

This includes periodical and newspaper collections which are arranged alphabetically rather than by subject, documents collections which are arranged by source of origin (Sudocs number, United Nations document number), or category (British Parliamentary papers, United Nations publications), microforms which are arranged by format and accession number and which, like audiovisual media, require interposition of a machine, maps which require a large examining surface to permit browsing the content rather than merely reading the bibliographic entry on the respective labels. Among research libraries, such materials cover an increasingly high proportion of resources. For example, "the microform

holdings of many libraries currently equal or exceed volume counts of hard copy books and serials."[7]

Library purchase of nonshelf-browsable resources, or physical arrangement in nonbrowsable order, does not reflect a new philosophy of curtailing reader access. Rather, consciously or unconsciously, it reflects an administrative decision that it is better for the library and its patrons to have an item in nonshelf-browsable form than not at all, or than at the expense of the additional staff time and funds needed to get it in paper form (micro-items), or to catalog and subject classify it (documents), or to arrange it by subject rather than merely alphabetically (periodicals). When library resources are arranged by a criterion other than subject, the librarian, consciously or unconsciously, made a cost-benefit decision that resulted in nonbrowsability or at least reduced browsability of the resources concerned. This article advocates extending such decisions to parts of the printed collection. It is written on the assumption that it is better to have some portions of the printed collection in nonshelf-browsable form rather than not to have them at all, or rather than to have them only at the expense of other services or resources. It is written on the basis of research findings that show that a librarian can calculate the break-even point at which he or she wishes to relegate resources to storage while delaying no more than a precalculated, and very small, percentage of requests. The need for such decisions is based on three factors: (1) a browsable printed collection requires much more space than a nonbrowsable collection—as I shall try to demonstrate later on; (2) it must be assumed that library capital and operating funds are finite: there is an upper limit above which university administrators are not willing to fund the housing and operation of academic libraries; and (3) within this upper financial limit the academic librarian has generally some freedom to allocate and shift services and resources.

## A HISTORICAL PERSPECTIVE

One of the problem areas in library administration is chronic space pressure, exerted by the constant growth of the collection. The standard, centuries old solution has been to provide enlarged, or new quarters, or a temporary annex, or higher shelving, or closer shelving density within the library philosophy and technical possibilities of the respective age.[8] While each of the following categories had earlier forerunners, and while none stopped abruptly, the following chronology illustrates librarians' reactions to increasing space pressures.

Before the twelfth century, most monasteries put their tiny but precious book collections into one or two small cupboards in the cloister or in a small room. The thirteenth century, with increasing readership, saw books stored typically in larger rooms on lecterns—that is, laid flat on a slanted desk surface that was both storage and reading space. Often these books were chained (see fig. 1). In the fifteenth century, space pressures necessitated a storage shelf or two to be added below the desk surface (see fig. 2), and by the seventeenth century the stall library stored many rows of books in a technique that was space efficient but awkward to access physically (see fig. 3). The stalls were typically arranged in alcove form with seating in between, or were arranged even more closely in a stack-like arrangement and were characteristic of the frugal English academic library (see figs. 4 and 5). These arrangements came to fruition by the end of the eighteenth century, with some notable later offshoots: Edinburgh University in 1825 and Copenhagen University in 1857.

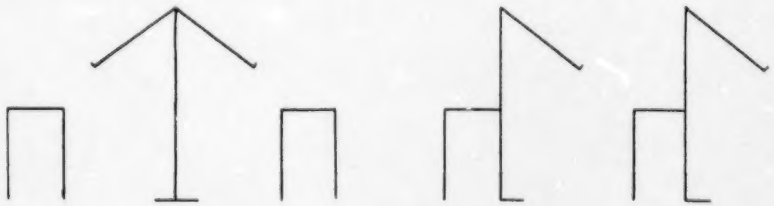

Fig. 1. Schematic cross section of two types of lectern shelving

Fig. 2. Schematic cross section of two types of lecterns with shelves below the desk. Used with, and without chairs.

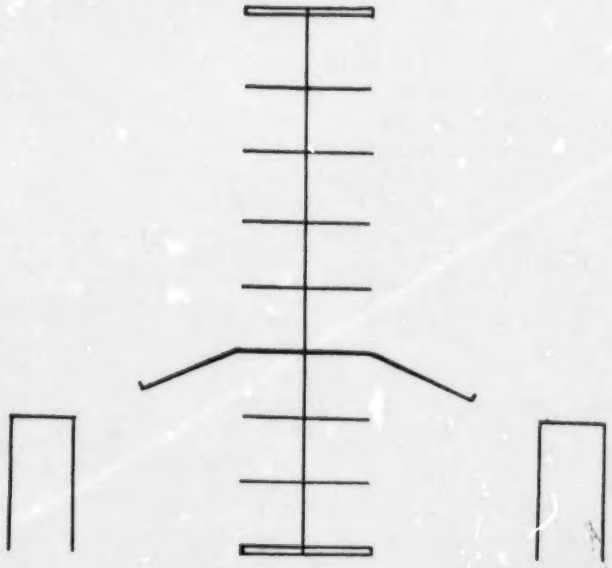

Fig. 3. Schematic cross section of tall book stall with desk surfaces and benches for readers.

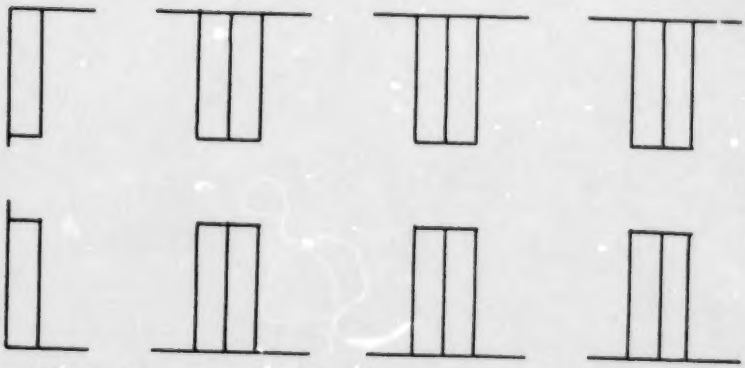

Fig. 4. Schematic floorplan of alcove library. Aisle and alcove width varied greatly. Alcoves often contained tables and benches.

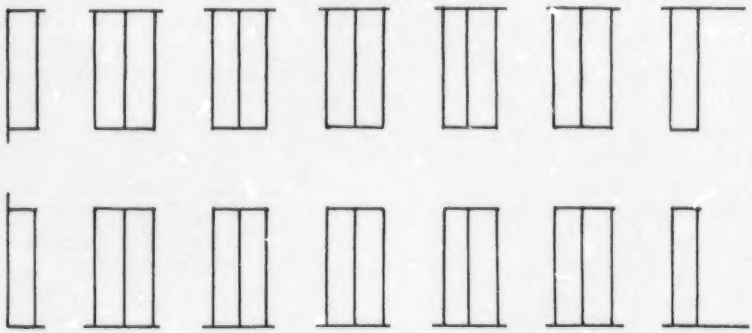

Fig. 5. Schematic floorplan of an early closely shelved "stack" library.

Simultaneously with the stall library, however, a totally different and, from a space-use point of view, quite wasteful movement developed which used only the room's outer edges for shelving purposes (see fig. 6) and tried to blend art and the ostentatious splendor (that in most cases the status of its noble and clerical patrons demanded,) with a scholarly atmosphere. Generally considered as beginning with the library of the Escorial in 1563, it culminated in the 1726 Austrian Imperial Library in Vienna. It was characteristic of the libraries of monasteries and the high nobility, but was also used, albeit with far less emphasis on art, for libraries that served purely scholarly purposes such as the unrealized plan of the Bibliothèque Mazarine (1647) in Paris.

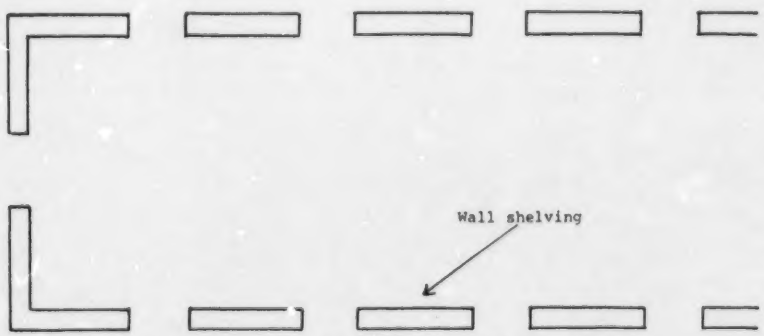


Fig. 6. Schematic floorplan of a "Hall Library."

Numerically, this "Hall Library" was far more common by the year 1800 than the scholarly stall or alcove, or the early stack library, especially on the European continent. Since only the edges of the single room that served as library were used for book storage, its use of floor space was quite inefficient. The central parts of the book halls were mostly empty, sometimes decorated with permanent displays such as large globes, but occasionally also housed a few reading tables. Unlike the medieval pulpit library and the later stall library, these libraries were not designed for in-house use. The increasing masses of books forced this type of library over the centuries to expand by building higher walls—as high as thirty feet—accessible through use of very dangerous ladders; by building galleries; and by expanding into adjoining rooms where the same pattern was repeated. But so strong was the desire for being surrounded by "walls of books," so great the owner's and architect's desire for ornamentation, so great the fear of change, that even into the early nineteenth century most librarians did not want to consider close shelving but merely advocated more of the same: More wall-shelved book rooms, with more galleries, with higher walls, but with over 90% of the floor space still unused. The early nineteenth-century parts of the British Museum Library were a combination of a series of wall-shelved rooms and alcove-shelved rooms, both of great height.

However, in the early nineteenth century a few pioneers began a radical departure which acknowledged the long-existing need for in-house use, for staff offices and for more efficient use of floor space. This led to the tripartite library that is still common today in academe. In 1816, Leopoldo della Santa developed a radically new, fully articulated theoretical, but never realized, plan for a tripartitioned library with separate close-storage, reading and office areas.[9] There was even a separate catalog room and several special purpose rooms (see fig. 7). Thirty years ahead of its time, it was roundly criticized by several library science authors. Actual buildings that used close, stack-like shelving in relatively small rooms began to be built in the 1820s (e.g., Frankfurt public library) although the stack arrangement was often ill-lighted. This trend toward separate and relatively close shelving, reminiscent of earlier English scholarly libraries, was popularized by the largest libraries of the age, the Bavarian Royal Library in Munich (1843), the Ste. Geneviève in Paris (1843), and especially by the central reading room, with surrounding stacks, of the British Museum Library in London (1856).

Early nineteenth-century continental writers did not know, or had forgotten, the space-saving stall and alcove system of the earlier English and continental scholarly library. Instead, they ridiculed the departure from the space-wasting multipurpose library hall that they knew, and simply

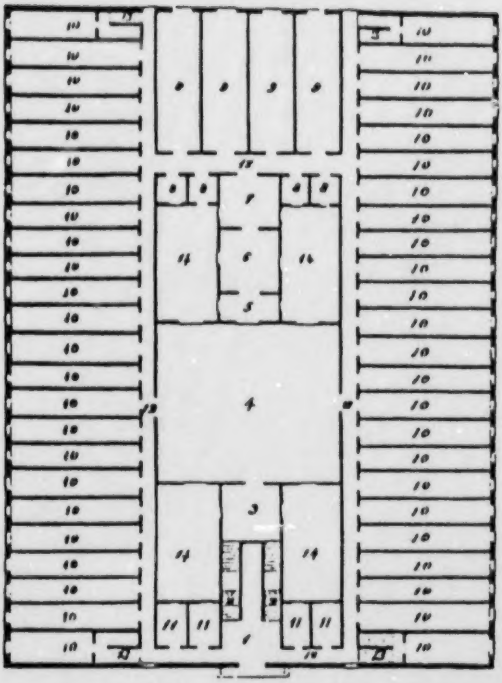

Fig. 7. Leopoldo Della Santa's 1816 floorplan of a tripartitioned stack library

1. Vestibule
2. Main Staircase
3. Upper Hall
4. Reading Room
5. Office of the Catalog Attendant
6. Catalog Room
7. Special Purpose Room
8. Offices
9. Special Collections
10. Book Rooms
11. Offices
12. Corridor
13. Staircase to Upper Floor
14. Courtyard

wanted more of the same. But, as so often is the case, the pressures of current reality along with new technological capabilities overrode initial misgivings. By the 1870s the idea of separate reading rooms and separate stacks, shelved as closely as the sensibility of contemporary librarians and the still embryonic artificial ventilation and lighting technology of the age permitted, was commonly accepted in Europe and, later on, also in the

United States. The development of the "new" stack system, with ever decreasing distances between ranges, has kept large libraries from becoming almost unusable. For example: A room 30 feet by 60 feet and 21 feet high, which employed only wall shelving with all walls covered with shelves except for door and window allowance, and using the standard 125 volumes per section which is designed to permit new insertions in a subject-classified library, would house about 20,000 books. For a 3 million volume collection, 150 such rooms would be needed, plus corridor space, etc. If arranged in a four story building, about 90 feet high, each floor would need to contain about 37 such rooms. From today's perspective such an arrangement seems absurd, not to mention highly user-unfriendly.

Today's academic librarian faces a similar kind of dilemma as our predecessors 180 years ago: Shall we assume that space pressures will continue to grow? (Remember, that some nineteenth-century writers felt that all that could be invented had been invented, and nothing new could be written!) If so, we have a range of possible alleviating measures. Or shall we assume that the computer age will bring totally new forms of publication that will stop space pressures? If so, we must plan in different directions.

**Electronic Publishing as a Space Solution**

The lure of electronic publishing as the *deus ex machina* space pressure solution is great. Yet the evidence points clearly to continued space pressures for at least another thirty years. "World-wide, the production of new books has more than doubled in the last twenty years; the number of scholarly books published each year in the United States rose from 3,000 in 1960 to 15,000 in 1980. The number of scientific and technical serial titles, worldwide, rose from less than 20,000 to over 50,000 in the same period."[10]

In 1980, worldwide production of monographs alone amounted to over 726,000 titles, excluding China. Counting monographic title production in only the principal book producing countries, over 600,000 titles were produced in 1980. These figures represent a steady increase in all types of countries: For example, in the developing countries book title production rose from 44,000 titles in 1955 to 144,500 titles in 1980. For North America, equivalent figures are 14,000 and 116,000 titles but should be much higher since they exclude U.S. state and local publications, federal publications not issued through the United States Government Printing Office, and many publications of institutes, proceedings of societies and other research publications. All figures given exclude serial publications.[11]

There are no signs that the growth rate will reverse in the near future, barring a literally global catastrophe, and it is inconceivable that this deluge can be transferred in the near future to electronic publishing. Electronic publishing and optical disk and videodisk storage, which have the potential of changing completely the presently known library use and storage patterns, are still largely in the planning, design and prototype stages which require a lead time of five to fifteen years before systems become industrially available and library budgets are restructured for obtaining them. Even technical perfection, however, does not imply economic viability, and serious questions about such viability exist with respect to much material suitable for large research libraries given current design costs.[12] For example, full-text storage of even limited-purpose projects, as the dissertations listed in *Dissertation Abstracts International*, is not economically feasible given current technology.[13]

Although technological developments in the area are fast and the cost of electronically published texts stored outside research libraries may well become economically feasible for a wider range of materials during the next ten years, major limitations will remain. Many materials with research value, such as foreign language materials, specialized data or rarely used materials, are not likely to be available in electronic format unless this format becomes cheaper and more convenient than paper format not only for the producer but also for the user, or unless universities, scholarly and professional societies, or the government subsidize electronic publishing. Since the commercial market is interested in electronic publishing such sponsorship seems unlikely. We must therefore conclude that, for the next few decades, the scholarly publications pattern of only some of the output of some of the technologically more advanced countries will be affected by electronics. Most likely that will be in the United States, Canada, West Germany, Britain, and Japan. As De Gennaro points out: "No convincing case for the end of print on paper has been made."[14] Others bear him out.[15] Whatever changes toward electronic publishing will occur will be far more rapid and pronounced in the areas of reference services and document delivery than in the area of storage space.

**Microforms as a Space Solution**

Increasing use of microforms, for original publishing or for copying existing paper based materials, could have a space saving effect. But there seems to be no stampede toward original publication in miniaturized form in the humanities and social sciences. In science and technology thousands of government-sponsored reports have been published for over 25 years in

microform, and yet total library space needs have grown. Commercial firms can only be interested in micropublishing frequently used products like the *Federal Register*, and few have a stock of more than a few thousand titles available in microform, hardly enough to make a space dent in a large library. That the federal government is delivering an increasing portion of its depository collections in microfiche will also have only a moderate effect on space, if one considers the relatively small space that documents collections occupy even now in most research libraries compared to the space devoted to serials and printed books.

Among libraries, microcopying efforts have been restricted almost entirely to retrospective copying of print material for preservation purposes. When viewed solely from a space point of view, it has not been proven cost-effective when compared with the building cost of storage centers.[16] It is, however, essential from a preservation point of view for those materials that can no longer be reconditioned. Increasing microcopying efforts are being made by individual libraries (notably the Library of Congress and the New York Public Library), by the Association for Research Libraries, and the Research Libraries Group. They are only partly coordinated and thus likely to result in less than perfect bibliographic control and in some duplication. Also, when fully implemented as presently planned, they will include at best 50 to 75,000 titles per year. The individuality of different research library collections is well known. Thus any one research library would hardly be able to withdraw more than 10 to 20,000 print titles per year from its own stock as a result of national microcopying efforts. For libraries receiving five to ten times as much new material per year, this represents at best a decrease in the number of new square feet needed per year.

All in all, the various plans and programs to convert material retrospectively to microform or electronic media, or to publish them in these forms in the future, are not developed far enough, and/or are not of sufficient magnitude to make a real impact on library space needs for the next 30 years. However, they will have an increasing impact on library services.

**Space Pressures for at Least Another Thirty Years**

Space pressures in academic libraries will also not be reduced because older materials soon will be preserved much more effectively and cheaply than heretofore. The Library of Congress has recently invented, with outside help, a process of mass deacidification that does not rejuvenate, but at least prevents future deterioration of nineteenth- and twentieth-century books. A recent law authorizes $11.5 million for the construction of a book

deacidification facility for the Library of Congress at Fort Detrick, Maryland which will initially treat 500,000 items per year at a cost of three to five dollars each. Other major libraries are undertaking jointly and individually other major preservation efforts.[17]

Even during the library building boom years of 1967 to 1974, book acquisitions outdistanced research library storage capacity.[18] Now that the boom has ended, storage space pressures are, if anything, likely to increase. They will continue until academic libraries turn from storage and delivery and in-house use centers to switching stations that store very little themselves but primarily search electronic supplies and/or central data banks, then sift and winnow the available material for pertinence and quality, and deliver—in-house or long distance—selected, individually tailored printouts of citations and text on demand. We are beginning to see some embryonic versions of this, for example with LEXIS and CIS in high-use areas, but they are not the norm. The full-scale version of this vision is 30 years into the future and demands a different professional outlook and greater subject knowledge than is now typical. While the computer has already greatly affected bibliographic retrieval, and while it is beginning to make an impact on the physical layout of public and staff areas, and while it will have a growing impact on preparation, administration and service, its effect on library storage capacity of major academic libraries will be felt only 30 years from now, perhaps even later.

Most of the other options that exist at present for alleviating space pressures also have some value, but the advantages are also often more theoretical than real, at least from a space saving point of view. Reducing purchases unilaterally has never been effective long range for research libraries. Coordinated acquisitions programs among a few cooperating institutions tend to result only in a shifting of purchase monies to other subject areas or types of material, rather than in reduced purchases and thereby saving storage space. The use of national and regional storage libraries and regional centers such as the Center for Research Libraries undoubtedly enriches the region's resources but has typically not caused a decrease in the individual research library's need for storage space.[19] Most likely, academic libraries will continue to use all of these devices with benefits largely other than space saving. The most dramatic benefits in the area of saving storage space arise from local compact storage.

**Local Storage**

Local storage centers have existed for many decades. Many of the early ones were intended for temporary overflow until a new library could be built.

During the past 30 years, however, permanent individual or system library storage centers were built, for example, by Yale, New York Public, Texas, Princeton, California, and Cornell. Among their characteristics are:

1. They house materials considered valuable enough to keep under institutional control, but not frequently enough used to justify prime campus space in an active, professionally staffed, bibliographic organization.
2. They house material about which someone, usually the library staff, had to make placement value judgments either by category (such as "foreign language serials that had not circulated in *x* years") or individually.
3. They shelve materials more closely than presently customary in a library, and thereby save floor space. Typically, they shelve by size rather than by class number.

There is also a growing and justified trend toward incorporating compact storage facilities as part of new or existing library buildings. The problem that still needs solution in these instances is to find optimal functional space relationships among the five components: resources in regular storage, resources in compact storage, space for patrons, space for staff, and space for bibliographic and reference apparatus.

When one considers the possiblity of a local or systemwide compact storage center, or of incorporating compact storage in a regular library building, two major questions arise: (1) What materials can be selected for storage, and who selects it; (2) How will the stored resources be housed?—in the existing library or in a separate building; in classed order to permit shelf browsing, or by size to permit greater space saving? It is the thesis of this article that compact storage of selected academic library resources should, and will, become as routine as selecting new resources; that stored materials, by their very nature, should be housed in sized, nonshelf-browsable compact shelving; that separate local storage centers are often essential; but that every academic library should also have an in-house, compact-sized storage area.

**Selection Criteria for Storage**

A routine approach which selects categories rather than individual titles for relegation to storage is generally considered best. Although sometimes hotly contested, the selection-by-category approach is far more economical of time than making judgmental, subjective decisions for individual titles, and it has proved reliable. From among the groups selected categorically

for relegation, librarians and faculty may want to make a few judgmental decisions and retain some individual titles in the regular collection. Such decisions may be based on various beliefs. For example, that a work is significant enough to stay in the active collection even if not used, or that it is atypical of its category and is more heavily used than it appears to be, or that future curriculum and research demands are likely to cause increased use of that title. Most libraries that have relegation programs accept such faculty requests without question, partly out of public relations considerations and partly because of respect for subject expertise. Interestingly enough, however, it has been found in at least one case that the titles which faculty wished to retain after they had been tentatively selected for relegation by category, had a significantly smaller circulation at the end of one year than the collection as a whole. This happened to be a small and active professional collection. It would be worth repeating the experiment with different types of collections.[20]

In the past, various categories have been suggested and used, such as age, language and subject: Books published *x* years ago in English in certain subjects, and books published *y* years ago in a foreign language in any subject, should be withdrawn automatically. Other categories are currency (ceased journals are often withdrawn), type of material (for example dissertations from other institutions), or availability in microform. A thorough discussion of subjective and categorical relegation is made by Slote.[21] A very thorough and dispassionate review of the literature, with British emphasis, is made by Gilder.[22]

The safest, and for some time the most frequently recommended, relegation criterion is use or, more correctly, nonuse. Research has shown repeatedly that works that have not circulated for a number of years in an academic library are even less likely to circulate in the future. This has been demonstrated by Fussler and Simon (University of Chicago, 1961),[23] Trueswell (Northwestern University, University of Massachusetts and Mount Holyoke College),[24] Cooper (Columbia University Chemistry Library, 1968),[25] Kent (University of Pittsburgh, 1979),[26] Hardesty (De Pauw University, 1981),[27] and Olson (Educational Materials Center, University of Wisconsin at Stout, 1982).[28] While circulation figures are sometimes challenged as a basis for relegation since they ignore in-house use, the weight of the research evidence points clearly to "a strong relationship between recorded circulation of books and in-house use of books," although the ratio seems to vary from library to library.[29] Hardesty found corroborating subjective evidence in his own institution that "books with no recorded circulation also had remained virtually untouched within the library."[30] It

seems safe to treat circulation figures for a category of works as proportional to, and therefore indicative of, total use figures for that category, and to use them for relegation purposes.[31]

Many of the same studies also show that a high percentage of an academic library's resources does not circulate at all, and that a small proportion of the collection is responsible for most of its use. Trueswell's 80/20 rule (that is, 20% of the collection is responsible for 80% of its circulation) and Kent's findings that almost 40% of an academic library's collection is never used, are benchmarks.

In other words, since a large percentage of an academic library's resources receive no use, since resources tend to be less used with age, and since past circulation is a reliable indicator of likely future use, the librarian can relegate with confidence a high percentage (25% to 45%) of an academic library's resources while causing delayed retrieval for a very small percentage of requests (1%, 2%, 3%). Two points are of significance in this connection:

1. The percentage of future delayed retrievals can be predicted on the basis of careful observation, calculation and selection of categories to be relegated.
2. While the percentage of delayed retrievals will rise in proportion to the percentage of relegated works, the two percentages increase at very different rates: A very large increase in the percentage of relegated works will cause only a small increase in the percentage of delayed retrievals.

Academic librarians are thus now in a position to relegate not only considerable quantities of materials, but also to decide first what percentage of future requests they are willing to have delayed (1%, 2%, 2.5%), and on the basis of that decision to designate the categories of materials that are to be relegated. Olson, for example, found that in an active educational materials center collection of 7000 volumes the range of options was from weeding 43.71% of the collection (3060 volumes) if 91.36% of future use was to be satisfied, to weeding 4.32% of the collection (303 volumes) if 99.76% of future use was to be satisfied. The final decision was to weed 14.73% of the collection (1031 volumes) to satisfy 98.7% of future use.[32] Olson describes carefully the technique used and can serve as a model for similar projects of any size. She, like Slote, also shows that once the decisions have been made, the actual work can be done by nonprofessionals under professional supervision. Slote describes very thoroughly three different methods of selecting books for relegation on the basis of past use and is the most detailed specific treatment of this topic.[33]

**Housing and Arranging the Relegated Materials**

Library resources that are stored either in-house or in a storage center are usually shelved more compactly than in the standard type of shelving.

> The three basic methods of increasing storage capacity in a given area are: Shelving more books than customary in [standard] sections; devoting larger percentage of the available floor space to regular shelving; and using special kinds of shelving. Often these methods are used in combination. The methods used to increase storage capacity affect whether or not the area can be open to the public.[34]

Discussions of types of compact shelving, and of the respective increases in capacity are in Boll and Gilder.[35]

In general, the more compactly printed books are shelved, the less hospitable they are to shelf browsing, but shelf browsability demands subject classification which, in turn, requires that works of various heights be shelved together (except for extreme sizes), causing some space loss, and that 25% to 33% of each shelf be left empty to permit inserting new works in their logical order, causing considerably more space loss (see fig. 8). (Tighter shelving in a classed collection slows service and causes constant shifting of books because of uneven growth.)[36]

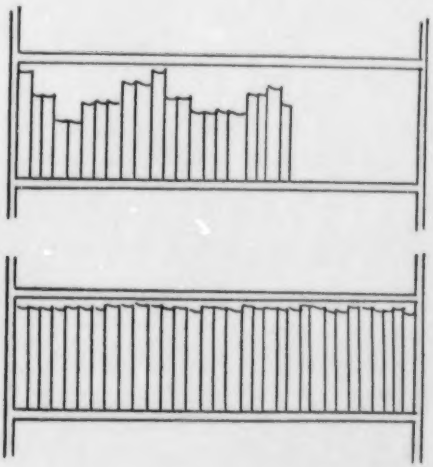
Wasted space in typical classed arrangement, with space left for insertions
Wasted space in sized shelving, shelved in accession order rather than in classed order

Fig. 8. Classed and Sized Shelving



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Much less known in this country, but increasingly used, is sized shelving—that is shelving books in four or more size groups, in accession order, and filling each shelf from end to end. Assuming the standard figure of 15 volumes per square foot of floor space, a very rough rule of thumb is that shelving books in compact but browsable order doubles the capacity of a given stack floor area, whereas shelving them compactly in sized accession order permits tripling the capacity. Individual cases will vary much since many variables are involved, such as the original aisle width and length, the combination of compacting factors used, feasibility of using minimal aisle width for staff use only, the size of the collection, and its subject distribution. Yale University, which uses special techniques, achieves even more spectacular density in its storage library and shelves four and one-half times as many books as with conventional shelving.[37] Highly automated systems, designed for relatively small and high use collections, provide even greater density but would not be cost-effective for large but relatively low-use storage. But, in general, space calculated to house 1 million volumes in "standard" browsable stack shelving can house 2 million volumes in compact browsable shelving and 3 million volumes in sized accession order shelving. In other words, the librarian who is willing to sacrifice shelf browsability for the least used printed volumes in a collection can delay the need for a new building or an extension about twice as long as the librarian who is not. In an existing building, the foundation's and the floor's capacity to carry the added weight, or to be reinforceable to carry the added weight, is a deciding factor. In a new building the decision can be made on a philosophical basis since new construction costs favor, if anything, close shelving.

Another strong argument in favor of sized shelving is cost-effectiveness since, unlike classed shelving, sized shelving does not require shifting existing stock to accommodate new insertions. While several large academic libraries have decided in favor of sized storage (for example, Yale, New York Public, Princeton, Texas, Cornell, and California) it will appear to many librarians to be a revolutionary new kind of administrative decision to make. However, it is merely one more step in a series of decisions we began many years ago:

1. As mentioned earlier, an increasing proportion of academic library resources have long been shelved in ways that make them only theoretically accessible to the public, but practically unbrowsable.
2. For over a century academic libraries have arranged their resources according to a sliding scale of speed of public access.

3. Shelf browsing is an excellect retrieval device for a casual search but very unreliable for research purposes.

Each of these points deserves explanation.

**Browsability *v.* Capacity**

Figure 9 shows a sliding scale of currently used shelving techniques arranged according to two axes, one representing space saving capacity, the other shelf browsing capability. Figure 9 is not intended to show the totality of bibliographic and physical access to resources. For example, it is not intended to reflect a situation in which a user of the *Congressional Information Service* finds a bibliographic reference in the *CIS* and then can turn immediately to the neighboring microfiche cabinet in order to see a copy of the document concerned. Figure 9 centers on the question: What kinds of shelving arrangements are presently used in academic libraries, and to what degree do these arrangements save floor space and facilitate shelf browsing? While the arrangement is intuitive and the placement of individual categories may be debatable, figure 9 shows at the very least that, contrary to the common impression, many academic library resources are not shelf browsable.

**Degrees of Speed of Public Access**

Apart from the shelving method employed, for over a century the principle of immediate and equal public access to all library resources, regardless of frequency of use, has been more theoretical than real. At present, four degrees of access speed are typical for academic libraries:

1. *Immediate access:* Reference collection, reserve collection.
2. *Fast access:* Rest of the cataloged collection in the building in which one happens to be.
3. *Slow access:* Resources elsewhere on campus, resources under special security, uncataloged resources accessible only through special indexes and typically requiring staff assistance, such as many government publications or micro-items.
4. *Delayed access or no access:* Resources housed outsides one's own institution, or resources in use or lost.

The fast access category is typically the largest but especially in research libraries, the slow access and delayed access categories are usually much larger than suspected. Librarians who are considering putting the least used part of their printed resources into nonshelf browsable compact storage which will cause delayed retrieval, thus are merely adding another type of resource to the slow access category.

1 Subject Reading Room or Reference Room, regular classed shelving
2 Stacks, regular classed shelving
3 Subject Reading Room or Reference Room, classed arrangement but by category or format outside the regular sequence such as outsize books, vertical file, books behind the counter
5 Stacks, classed arrangement but by category or format outside the regular sequence, such as outsize books, protected books.
11 Subject Reading Room or Reference Room, compact classed shelving
12 Stacks, compact classed shelving
4 Subject Reading Room or Reference Room, regular shelving by source, such as Sudocs
6 Stacks, regular shelving by source such as Sudocs
7 Subject Reading Room or Reference Room, regular shelving alphabetically, such as telephone directories, A & I services
8 Stacks, regular shelving alphabetically, such as periodicals
13 Subject Reading Room or Reference Room, compact shelving by source such as Sudocs
14 Stacks, compact shelving by source such as Sudocs
9 Subject Reading Room or Reference Room, regular shelving by format such as maps, microforms, with each category subdivided by source (Nat'l Geological Survey) or format (map scale, microform)
10 Stacks, regular shelving by format such as maps, microforms, with each category subdivided by source (Nat'l Geological Survey) or format (map scale, microform)
15 Subject Reading Room or Reference Room, compact shelving by size or format (outsize books, microfiche)
16 Stacks, compact shelving by size or format (outsize books, microform, books in some storage centers)
EXCELLENT
SHELF BROWSING CAPABILITY
NONE
MOST
SPACE SAVING CAPACITY
LEAST

Fig. 9 Current Shelving Techniques Rated for Shelf Browsing Capability *v.* Space Saving Capacity

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## SHELF BROWSING AS A RETRIEVAL DEVICE IN RESEARCH LIBRARIES

There is considerable difference between the myth and the reality of shelf browsing. Excessive size, for example, impedes effective shelf browsing. Ratcliffe,[38] Rovelstad,[39] and Wood[40] all argue that browsing becomes less productive with increasing size. In Rovelstad's words, "there is a maximum size for an open shelf collection beyond which open shelves become a liability and a luxury, and even a disservice to readers and staff.[41] In this writer's opinion, a 1.5 million volumes stack collection, including bound serials, is the cut-off point. Apart from collection size, one must also distinguish situations in which shelf browsing can be a helpful and satisfactory retrieval device from other situations in which it is not called for. Since desire for browsability is the major reason for clinging to the classed and space wasting arrangement, a detailed examination of its usefulness in an academic storage library, or in the storage section of an academic library, is in order.

The value of shelf browsing has been debated in the literature for many years. Hyman reviewed it thoroughly in the context of shelf classification in 1972, 1980 and 1982, taking a neutral stance; Gilder *et al.* reviewed it in 1980;[42] Boll produced a short list of obstacles to successful browsing;[43] Morse developed mathematical models and suggested a maximum size browsable collection[44]; Apted essentially quotes different definitions of the term;[45] Soper showed that personal and nearby collections tend to be preferred.[46] What seems to be lacking is a detailed list of specific points showing why shelf browsing is not a helpful retrieval device for research purposes.

### Shelf Browsing: Useful*

Shelf browsing is a helpful bibliographic approach to library resources in all situations where not one specific title is required, but one of a kind. It is useful in the many situations when one book would do as well, or almost as well, as another on the same general topic. In this respect it is useful for school libraries, most areas of most public libraries, and large parts of departmental collections in academic libraries. Shelf browsing is also helpful when a carefully selected group of frequently used materials is used

*I acknowledge gratefully the permission granted by Karl Nyren and the *Library Journal* to base the list of arguments on browsing on the much briefer list contained in my report *To Grow or Not to Grow: A Review of Alternatives To New Academic Library Buildings*, LJ Special Report No. 15. (New York: Bowker, 1980).

primarily by experienced staff, in other words, in reference and bibliography collections. It is also useful when the user knows the specific class number including its limitations, something virtually impossible to achieve without considerable study. Shelf browsing is also useful for materials, published recently, perhaps, during the last ten years, that is, materials that have been proven to be used more frequently than older materials.

**Shelf Browsing: Not Useful**

Benefits of shelf browsing are outweighed by space considerations for resources in a format that prevents effective browsing; and for resources (and especially printed—bulky—resources) that are very rarely used such as once every 20 or fewer years.

Shelf browsing is not needed when typical access is likely to be via a bibliographical footnote or reference, for example for materials that are likely to be used for research projects rather than for classroom teaching. The typical search approach in such cases is likely to be by name, by the work's title, or by series, but not by subject.

Shelf browsing will present increasing, but usually unrecognized, obstacles when the total stack collection grows to over approximately 1.5 million volumes.

Shelf browsing is actually harmful, since it provides a false sense of security, when a complete search of materials available on a topic must be made, in other words, again for research projects and serious academic papers. The following section will examine this point in detail.

## SHELF BROWSING: INSUFFICIENT RETRIEVAL FOR SERIOUS RESEARCH

Forty-five years ago Grace Osgood Kelley proved that, using the Dewey Decimal (DDC) or the Library of Congress (LC) classification, less than 6% of all the material on three specific zoological subjects could be found in a large academic library under the respective class numbers. In a subsequent study she showed that, of material listed under a specific subject heading in the catalogs of four major libraries, only one-third was shelved under the subject's specific class number. The other two-thirds are shelved under broader or entirely different numbers.[47]

In 1981, Saunders, Nelson and Geahigan selected book titles listed in major social science and humanities review journals such as the *American Anthropologist* or the *American Historical Review* and found that only about 31% to 80% of these books had been classed in the respective DDC numbers, and only about 27% to 78% in the respective LC numbers. The editors evidently found a far wider range of materials of subject interest than the DDC and LC numbers allowed.[48]

In other words, Kelley as well as Saunders, Nelson and Geahigan show that shelf browsing leads to only a portion, and sometimes a very small portion, of the locally available materials on a subject. As previously mentioned, it is, therefore, useful only in situations in which a selected sample is sufficient, but not for research purposes in research libraries.

Five categories of reasons make shelf browsing a less than reliable subject access device for serious research:

1. The items may have been temporarily removed from their shelf location without the browser's knowing it;
2. The items may never have been classed in the logical location in which the shelf search occurs.
3. There may actually be several logical browsing locations for a concept, only one of which is likely to be known to the browser;
4. Many classes, and even minute subdivisions of classes, exist in large libraries that are too large for browsers to search effectively;
5. No library resources can replicate the total available resources on any subject as well as a group of bibliographical tools can.

The following itemization will show the wide range of the above five categories, and why shelf browsers cannot get an overview of what exists, but only of part of what a library owns in a topic.

**Reasons for Shelf Browsing Insufficiency**

*Temporary Removal*
Books may be in circulation or on reserve, or lost, or misshelved. In no case is their absence indicated on the shelf being browsed, unless a gap remains where the book had been. The gap, however, usually does not tell what book was removed and is sometimes closed by stack attendants anyway.

*Items not Classed in the Logical Location that is being Browsed.*
Many materials—perhaps equally good, perhaps even more suited to the browser's purpose—are in the library but are not classed with other books on the desired subject. Examples:

1. If the desired topic happens to be a substantial but secondary one in a book, the book is classed with the "other," the main topic. In a catalog it might be listed under both topics; in a database using descriptors it would most likely be listed under many access words.
2. Some of the books on the desired topic may be shelved in a separate size sequence. The catalog or bibliography list both sizes under the suitable subject heading; the shelves give no indication that the location is split.
3. The book with the desired topic can be classed with its series rather than with its own subject. The catalog and especially a bibliography may contain analytics, but the shelves again give no clue that additional material on the topic is elsewhere. Especially the less popular series, foreign language materials, society transactions, government statistics, the stuff that forms the backbone of research, are likely to be classed as series rather than separates, each volume with its own topic.
4. The physical object that contains the desired topic is often in a format that the library does not catalog, or that the library houses in its own sequence, such as (a) Periodical articles: These can only be approached through abstracting and indexing services (A & I services) or databases; (b) Federal and United Nations documents, and selected foreign documents like the British Parliamentary Papers: These cover virtually all fields of knowledge, form a substantial collection in most large academic libraries, and are typically shelved separately, under their own classification systems. Even those few documents that are classed like trade books are often classed as a series, that is, under a broader class than the topic of the individual item (see number 3). Typical access is only through bibliographies. (c) Documents of the states of the United States: These are sometimes shelved by a separate classification system, and sometimes integrated into the classed collection. If integrated, they are typically classed by series (see number 3) rather than by the topic of the individual item. Typical access is through a combination of the catalog and bibliographies. (d) Government-sponsored research reports issued with their own numbering such as NASA or PB reports: While some may be cataloged, the bulk is likely to be shelved by format (paper or microfiche) and, within format, by their own numbering system, away from their classed equivalents that are being browsed. Typical access is through bibliographies or abstracting and indexing services. (e) All kinds of material purchased in microforms: "Microform holdings in many libraries currently equal or exceed volume counts of hardcopy books or serials."[49] They include copies of individual out-of-print trade items, serial runs, special collections such as the *Human Relations Area Files*, and pre-packaged collections such as *Landmarks of Science* by Readex Microprint Corporation.[50] Access to the individ-

ual work is either through the catalog or through bibliographies or special guides, but never through shelf browsing. (f) Pamphlet or ephemeral materials, or materials considered not worth cataloging in a large centralized system. These are typically housed in special files.

*Several Logical Locations, of which Only One is Likely to be Known to the Browser*

1. Both the DDC and LC classification schemes scatter different aspects of one topic throughout the classification and thus throughout the stacks. Material on "Drinking and traffic accidents" is scattered in nine LC locations, material on "Drug abuse" in 38 locations.[51] The DDC puts general material on "Museum buildings" in three places, "Astrology" also in three places, and "Water pollution" in 17 places.[52] It happens therefore easily and often, *and without the browser's knowing it, let alone knowing how to counteract it*, that the general shelf search is far less thorough than might be expected.
2. The subject expert's view of a topic may well be broader than the classification schedule allows, as shown by Saunders, Nelson and Geahigan, but it requires much sophistication for the browser to know where material related to a desired topic might be outside of its official DDC or LC haven.
3. Both the DDC and LC classification systems are continuously revised, expanded and changed, often extensively. Thus books received over a number of years *on one topic* are put into different class numbers.[53] Most libraries, especially the larger ones, stopped long ago to relocate their old books to the new class numbers. They merely let them stand in the forsaken spot. The browser's only chance of discovering these locations, other than by pure chance, is to browse *after* having consulted the catalog or earlier editions of the classification scheme; not a likely procedure.
4. Most research libraries are classed by LC which is known for its tendency to class geographically rather than by precise topic, for its method of often subdividing topics by technical form (such as Items in the form of...), and for using alphabetical rather than logical sub-sequences, and sometimes several of these. The American Library Association Classification Committee knew whereof it complained in 1964: "It is practically impossible to browse with LC although people try it all the time."[54] To succeed in a search that involves more than one single specific LC class number the browser must be very familiar with the system. Most library users are not.

*Classes Too Large and/or Too Mixed to Shelf-Browse*

Even if one browses only a single class number—knowing its precise meaning—the group may be discouragingly large and/or confusing for a browser. In the writer's own library school library there are 428 titles or 918 items in DDC class 025.3, encompassing at least eleven distinct topical subdivisions *not* expressed as separate concepts by that number. In the University of Wisconsin—Madison Memorial Library there are approximately 550 volumes shelved under LC class number XH40, encompassing fifteen distinct subdivisions not expressed by the class number. Admittedly, most LC and DDC class numbers involve smaller numbers of books and are thus easier to shelf browse. Many shelf-browsing searches however involve, or at least should involve if properly done, not one specific number but a range of adjoining numbers such as Z356 to Z363 for Bookselling and Publishing in the Netherlands, in which case likely target groups, if known to the browser in a large research library, can involve hundreds of books. Such quantities strain the physical endurance and attention span of the average shelf browser who must typically stand, crouch or squat while shelf browsing. The result is likely to be a search cut short, or at least less attentive and thus less effective.

*Incomplete Resources and Changing Selection Criteria: Shelf Browsers Cannot Obtain an Overview of What Exists or of What They Need Now*

As mentioned earlier, world production was over 726,000 for monographic titles in 1980, excluding some major categories, and has steadily increased for decades, even centuries. The monograph acquisitions figures of no academic library even begin to approach these figures. Clearly, even if the earlier reasons for shelf browsing inefficiency would not apply, no shelf browser in an academic library can get an overview of existing materials. It is generally accepted by now that any researcher who limits a search to one library's resources searches in a limited universe,[55] shaped by the library's evolving selection criteria which do not necessarily reflect in depth the institution's or the researcher's present needs.[56] Researchers who rely within this limited universe on shelf browsing for their literature searches are double hobbled, as shown by the points made earlier.

**Summary on Browsing**

While browsing can be very helpful in selected situations—as previously mentioned—its danger is that its shortcomings for the serious researcher are obvious to very few of them, and not even to all librarians. Shelf browsing does give the patron the ability to examine and accept or reject an idea at once without having to go through the time-consuming formality

of charging an item out. But it does not give the patron the ability to sift and winnow among the library's full resources, let alone among the total existing relevant resources that a serious researcher expects. Classed shelving, therefore, should not be employed in storage situations where rarely used materials are stored to serve mostly research purposes. The institution as a whole would benefit far more from the increased storage capacity gained by sized shelving. The time has arrived for every academic library of 1.5 million volumes or over to shelve from 33% to 50% of its collection compactly, in-house and/or in a separate storage facility, with sized shelving. While these figures will seem excessive to some readers, they will be considered conservative 25 years hence.

**Dividing the Printed Book Collection Between Classed (Browsable) and Sized (Unbrowsable) shelving**

As shown in table 1, a high proportion of the resources of large research libraries is already housed in nonbrowsable formats or arrangements. A reasonable extension to the printed book collection might result in a distribution not unlike that reported by Rovelstad.[57] Materials that seem particularly suited to shelf browsing (in spite of its shortcomings for organized research purposes) and thus to shelving in the traditional subject-based way, are:

—The reference collection.
—The bibliography collection, including abstracting and indexing services and all types of bibliographies.
—Titles published during the preceding 10 to 25 years, with the breakoff point depending on the subject matter and the local situation, and based on the proven "prior use" technique recommended on the previous pages.
—Large sections of departmental and divisional collections. In this area librarian and faculty judgment may find greater play, partly for public relations reasons.
—Other categories that fit the local situation.

The rest of the collection can be put in compact, sized storage. The larger the collection the higher the percentage of materials that can be stored in sized shelving on the basis of very low prior use, or nonuse.

*Space Gains*

Using the above categories, a library of 1 million volumes should be able to store approximately one-third of its collection, and libraries of 2 million and above at least half their collection, in sized shelving. For a 1 million volume library this policy should result in the following space gain:

| | |
|---|---|
| At 15 volumes per square foot, 1 million volumes require | 66,667 sf. |
| If 1/3 of a 1 million volume library is housed in sized stacks, the following results: | |
| 666,667 volumes at 15 volumes per square foot require | 44,444 sf. |
| 333,333 volumes at 45 volumes per square foot require | 7,407 sf. |
| Net gain for additional books | 14,816 sf. |
| If these additional books are housed in regular shelving at 15 volumes per square foot, space is gained for | 222,240 vols. |
| If these additional books are housed in sized shelving at 45 volumes per square foot, space is gained for | 666,720 vols. |
| If half of the gained space (7,408 sf.) is given over to regular shelving and half to sized shelving, (which seems the most reasonable situation) space is gained for | 444,480 vols. |

For a library adding 45,000 volumes gross per year (which is an average figure for academic libraries of approximately 1 million volumes)[58] this extends existing storage space life for another ten years at a construction cost, and an annual storage overhead cost far less than the cost of building a regular stack addition and housing materials in it.

*Inexorable Space Pressures and Increasing Computer Capabilities*

There may well be initial faculty opposition, and many librarians may also feel uneasy about putting large portions of their resources on a routine basis into compact, that is, not shelf-browsable storage, just as many early nineteenth-century librarians were uneasy about removing most books from the public areas in which they provided not only resources but the proper studious atmosphere according to the views of the day. But just as materials pressures caused the stack development of the nineteenth century, so our own space pressures will unquestionably lead during the next three decades toward shelving increasing quantities, and finally the bulk of large collections, in compact storage by size rather than subject. The increasing number of compact storage annexes (Princeton, Cornell, Texas, California, to name the more prominent ones) shows that some academic libraries have begun to move in this direction. Only in the second decade of the twenty-first century, when research libraries may have become, in effect, switching and sifting stations between centralized computer data/information bases on the one hand and patrons on the other, will the need for ever growing storage areas subside.

Taking the long range view, one sees much greater searching capabilities ahead that will far outweigh any real or presumed loss in shelf browsing

capability. Our bibliographical records are in the initial stages of a major, computer-induced revolution. Computerized retrieval tools permit far more access points, far deeper integration, much faster cumulation than their paper-based versions. There are clear signs of demands for still more access points including subject access points.[59] The computer also makes subject access by logical grouping (class numbers) and by alphabetical grouping (subject headings) technically easy to achieve without the need to maintain cumbersome and expensive multiple paper files. The benefits of this double approach to a serious researcher need no elaboration. This time of change, which will see the computerized bibliographic database become an infinitely more powerful, comprehensive and versatile retrieval tool than its paper-based predecessors, is a suitable time for beginning to limit shelf browsing capability to those areas of a research-oriented library that deal primarily with current and frequently used resources.

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